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SOCIETIES AND ACADEMIES.

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

THE twelfth meeting of the Society for Experimental Biology and Medicine was held in the laboratory of clinical pathology of the Cornell University Medical College, on Wednesday evening, May 24. The Vice-President, Edward K. Dunham, was in the chair.

Members present.—Atkinson, Auer, Brooks, Burton-Opitz, Crampton, Davenport,* Dunham, Emerson, Ewing, Field, Flexner, Gies, Herter, Levene, Levin, Lusk, Meltzer, Mendel,* Morgan, Noguchi, Norris, Oertel, Opie, Richards, Salant, Sweet, Torrey, Wallace, Wolf.

Members elected.—Joseph Erlanger, E. O. Jordan, Otto Folin.

ABSTRACTS OF REPORTS OF ORIGINAL INVESTIGATIONS.†

Contributions to the Study of Sulfur. I. The Metabolism in Brombenzol Poisoning: W. MACKIM MARRIOTT and C. G. L. WOLF.

Administration of brombenzol to dogs resulted in increased elimination of nitrogen and urea. Urea closely followed total nitrogen. Preformed ammonia was decreased. Creatinin elimination was not appreciably affected. Total sulfur excretion was not increased, but there was almost complete suppression of alkali sulfates. Excretion of neutral sulfur, represented for the most part in this case by parabromphenyl-mercapturic acid, was increased 400 per cent. Ethereal sulfate elimination was markedly increased. Total sulfate-sulfur was diminished. Excretion of chlorin and phosphorus was practically unaffected. Nitrogen and fat were increased in the feces. The drug caused ulceration of the stomach and intestines, and degeneration of the liver and kidneys.

* Non-resident member.

† The abstracts presented in this account of the proceedings have been greatly condensed from abstracts given to the secretary by the authors themselves. The latter abstracts of the reports may be found in current numbers of *American Medicine* and *Medical News*.

On Experimentally Produced Variations in the Energy of Tumor Growth: LEO LOEB. (Presented by James Ewing.)

The author's observations point to the general conclusion that it is possible to cause an experimental increase or decrease in the energy of tumor growth. Such variations may be brought about by direct stimulating or depressing influences on the tumor cells. The stimulation effects may become cumulative.

Demonstration: Photographs and Plumage-charts of Hybrid Poultry, with Remarks: CHARLES B. DAVENPORT.

Dr. Davenport exhibited photographs and plumage-charts of four hybrids between different races of poultry, and also of their parents, and remarked on the nature of the inheritance illustrated by each example.

Experimental Cirrhosis of the Liver: RICHARD M. PEARCE. (Presented by Eugene L. Opie.)

Necrotic lesions were produced in the liver of the dog by injections of hemolytic immune sera of high hemagglutinative power. The author's observations have demonstrated that cirrhosis may follow extensive primary destructive lesions produced in this way (a view not yet fully accepted) and thus support the contention of Kretz that cirrhosis is essentially the result of a series of repair processes following repeated injuries of liver parenchyma.

Experimental Arteriosclerosis: RICHARD M. PEARCE and E. McD. STANTON. (Presented by J. E. Sweet.)

Intravenous injections of adrenalin produce in rabbits vascular lesions that are limited to the aorta and that exhibit more or less definite sequence. Five to six injections of 3 to 25 minims of 1-1,000 solutions every 24-48 hours for long periods cause at first histologically important changes in the media. After about 12-15 injections very definite lesions are evident macroscopically. In the experiments continued for 6-8 weeks, the process becomes very diffuse and small dilations of the thinner portions of the aorta assume the appearance of aneurisms. At this stage the destruction of the elastic fibers is

extreme and all degenerated areas are infiltrated with calcium salts.

Whether the vascular changes are due to a primary toxic action of the adrenalin or whether they are the result of the increased arterial tension which it causes, has not been determined.

On the Chemical and Physiological Properties of Ricin, with Demonstrations: THOMAS B. OSBORNE and LAFAYETTE B. MENDEL.

The most active preparation proved fatal when administered subcutaneously to rabbits in the small dose of 0.0005 milligram per kilo of body weight. The toxic constituent of the castor bean appears to be an *albumin*. Ricin is like other albumins in composition, heat coagulation, color reactions, precipitation reactions, specific rotation, state of combination of its nitrogen, etc. By tryptic digestion the agglutinating power of pure ricin may be greatly impaired or destroyed. The experience of the authors lends no encouragement to attempts to 'purify' such toxins by methods designed to eliminate proteid substances from the active materials.

On a Method of Determining Indol, with Demonstrations: C. A. HERTER and M. LOUISE FOSTER.

The authors described a rapid and accurate means of determining indol. It is based on the fact that indol, in slightly alkaline solution, readily condenses with naphthoquinon sodium mono-sulfonate and forms a *blue* crystalline compound that is only very slightly soluble in water but is readily extracted by chloroform from a watery solution or suspension. The condensation product is di-indyl naphtho-ketone mono-sulfonate. Its solution in chloroform is *red*. The method is well adapted for colorimetric or gravimetric determinations.

Anesthesia Produced by Magnesium Salts, with Demonstrations. A Preliminary Communication: S. J. MELTZER and JOHN AUER.

The authors exhibited two guinea pigs which were deeply narcotized by subcutaneous injections of magnesium sulfate. One of these animals had been similarly narcotized twice

before and fully recovered each time. If the dose of magnesium salt is not too large, heart beat, blood pressure and respiration remain nearly normal during periods of narcosis in which any operation can be performed without resistance. Certain maximum doses can not be exceeded without causing extremely toxic effects.

Enzymes and Anti-enzymes of Inflammatory Exudates: EUGENE L. OPIE.

Inflammatory exudates removed from the pleural cavities of dogs one or two days after injection of the irritant (aleuronat) undergo very little change, while those removed three or more days after the onset of inflammation exhibit appreciable though slight autolysis. There is no relation between the amount of digestion and the number of cells which are present. The serum inhibits autolysis in a suspension of the cells separated by centrifugation. The antilytic action of the serum is favored by an alkaline reaction, but is completely prevented in an acid medium. The serum of the exudate contains a proteolytic ferment which is active only in an acid medium. In the later stages of such inflammations there is some diminution of the antilytic power of the exudate.

Shallow Well Waters of Brooklyn: JAMES P. ATKINSON.

The author's observations justify the conclusions that the sandy soil of Brooklyn can not be relied upon as a safe filter for the well waters of that borough, that Brooklyn soil in populous districts seems to be nearing the saturation point for sewage, and that many of the shallow wells in Brooklyn are, therefore, in growing danger of serious pollution.

The Influence of the External Temperature upon the Viscosity of the Blood: RUSSELL BURTON-OPITZ.

The author has found that the viscosity of the 'living' blood can be greatly influenced by changing the external temperature. Viscosity was markedly increased in dogs immersed in water at 25° C. Warm water baths (42°-45° C.) produced a corresponding decrease in the viscosity. Specific gravity of the blood showed corresponding variations.

The Changes in the Viscosity of the Blood during Narcosis: RUSSELL BURTON-OPITZ.

It was found that the viscosity of the blood is increased by deep ether or chloroform narcosis and lessened during light anesthesia. Specific gravity of the blood was increased by deep and lessened by light ether narcosis. Chloroform, on the other hand, produces a slight decrease during deep and an increase during light narcosis. Hence the specific gravity can not be regarded as a perfectly accurate index of the viscosity.

Studies of the Effects of Radium on Plants and Animals, with Demonstrations: Communicated by WILLIAM J. GIES.

I. Preliminary notes on the effects of radium rays on plants. C. Stuart Gager. Plants are stimulated. For this stimulus there are minimum, optimum and maximum points, depending upon the proximity of the radium to the plant, the strength, quantity and condition of the radium salt, the time of exposure and the nature and condition of the tissue.

II. The action of radium rays on *Amœba proteus* and upon other microorganisms. Louis Hussakof. No visible effects were produced, by even the strongest radium preparations, during periods of observation of about an hour. The water surrounding the animal in each experiment may have prevented radiant effects.

III. The effects of intravenous injections of radium bromid. Russell Burton-Opitz and G. M. Meyer. Increased blood pressure, caused by general vasoconstriction, always promptly followed injection of radium preparations in small dogs. This effect was soon followed by a fall of pressure, due to decrease in frequency and accompanied by irregularity of the heart. The variations in blood pressure were extreme. These effects occur after division of both vagi. Respiration gradually decreases in frequency until respiratory paralysis results. A striking qualitative similarity was found to exist between the effects of pure barium bromid and radium bromid preparations of low activity (240 and 1,000). Radium bromid of 10,000 activity, however,

differed from barium bromid in failing to cause irregularity in the action of the heart. Quantitative differences were also noted.

IV. The radioactivity of the different organs after intravenous injections of radium bromid. Gustave M. Meyer. Thus far determinations have been made only on the dogs used in the experiments of Burton-Opitz and Meyer (III). Practically all parts except the brain were found to be radioactive. The blood always manifested the greatest radioactivity.

V. The influence of radium bromid on metabolism in dogs. William N. Berg and William H. Welker. Feeding experiments have thus far failed to show appreciable results, except an increase in elimination of total sulfate in the urine.

WILLIAM J. GIES,
Secretary.

THE NEW YORK ACADEMY OF SCIENCES. SECTION OF GEOLOGY AND MINERALOGY.

At the meeting of April 3, 1905, Professor Stevenson presiding, the following papers were read:

The Physiography of the Adirondacks: J. F. KEMP.

The Adirondacks cover some 10,000 square miles, and except for the White Mountains of New Hampshire and the Blue Ridge of North Carolina, are the loftiest summits east of the Black Hills of South Dakota. They are metamorphosed Precambrian sediments and eruptives with a surrounding fringe of Paleozoics beginning with the Potsdam and ending with the Utica, except for the Glacial drift. The eastern portion is mountainous, the western a high plateau which slopes to Lake Ontario. Three peaks exceed 5,000 feet. The general profile of the mountains is serrate, but there is great variety of shape. There are two contrasted types of valleys. One type, doubtless an instance of greater geological antiquity, presents gentle slopes and great maturity of form. Its members run east and west, and north and south, and are occupied in some cases by the larger lakes.

The second type is more recent, and is due to faulting. The valleys have on one or both sides precipitous escarpments. The cliffs run

northeast and southwest or northwest and southeast. A third series of breaks running nearly due north is also at times in evidence. The faults are most often the result of differential movements causing even a marked sheeting of the rocks. The faults run out into the Paleozoic areas, and are shown with diagrammatic distinctness, where they have been especially described by H. P. Cushing.

The problem of the drainage is of especial interest. All the waters go ultimately either to the Hudson or the St. Lawrence. The courses of the large streams follow sometimes the older type of valleys, sometimes the later. Barriers of drift have often driven them from their old lines across low, preglacial divides into new ones. The courses of the Hudson and Onondaga are particularly striking illustrations, each exhibiting one or more marked bends to the eastward. The courses of the two were described and discussed in some detail.

The different types of lakes were also described including the river valleys ponded by barriers of drift, the fault valleys and the relations to the older type of depression.

The nature of the ice invasion and its modifying effects were passed in review, chiefly along the work of I. H. Ogilvie. With a brief statement of the Post-glacial lake-fillings, etc., which have been especially set forth by C. H. Smyth, Jr., the paper closed.

The Paleogeography of Mid-Ordovicic Time:

CHARLES P. BERKEY.

Both the Cambrian and Ordovicic formations contain prominent sandstone strata alternating with dolomites wherever exposed in Michigan, Wisconsin, Minnesota, Iowa, Illinois, Missouri, Arkansas and Indian Territory. The northern margin, however, is prevailingly more arenaceous than the southern, where shales replace many sand beds. At still greater distance, in Ohio, Kentucky and Tennessee, these are in turn represented by limestones largely.

The uppermost one of the series is the St. Peter. This sandstone, as well as each of the more important ones below, is believed to represent an extensive retreat and re-advance of

the sea. Few marks of the erosion intervals are preserved. Only here and there has the mantle of sand permitted much attack upon the underlying dolomite, and the reworking of the sands themselves has obliterated most internal evidence of such history.

Much of the sand, furthermore, is wind-blown. This reworking by the sea and the wind is believed to be the chief cause of the extreme purity of the St. Peter.

The St. Peter stage of the Ordovicic, therefore, represents a retreat of the Mississippian sea from the vicinity of Lake Superior to probably as far as Ohio, southern Illinois and Arkansas, followed by a readvance to its original position. The northern part of the St. Peter contains a sedimentary break. In part it is both older and younger than the same formation in its southern extension, while, on account of the reworking accompanying the sea advance, there is greater conformity with overlying than with underlying beds.

A. W. GRABAU,
Secretary.

At the meeting of May 1, 1905, Vice-President Hovey presiding, the following papers were read:

The Pleistocene Beds of Sankaty Head, Nantucket: J. HOWARD WILSON.

When visited by early explorers, the section at this locality was kept freshly exposed by the cutting back of the bluff by the sea, but for quite a period of years this has been prevented by the northward extension of the Siasconset apron beach, so that the face of the bluff is now covered with talus and overgrown with beach grass.

The locality was visited during the summer of 1904 and considerable work done in exposing the section and making a collection of the fossils.

This work resulted in the collection of 81 species, 21 of which had never been reported from this point, including *Pandora crassidens* Conrad not previously found in any horizon above the Miocene, and *Serripes taperonsii* Deshayes and *Macoma incongrua* Von Mar-

tens belonging to the Arctic fauna of the Pacific coast and not heretofore reported east of Point Barrow.

A number of facts differing somewhat from those reported by former observers were noticed and have resulted in a somewhat different interpretation for the phenomena presented by these deposits.

The deposits are not of glacial origin, for (1) numerous delicate and unworn shells occur; (2) bivalves such as *Solen*, *Venus* and *Mya* occur in the position in which they lived with both valves together, and in the case of *Venus*, with the ligament in place; (3) the faunas are not mixed as would be the case if of glacial origin, the lower beds containing shoal-water species of a southern range, and the upper, deeper water species of a northern and even Arctic type.

The lower beds were deposited in a shallow inlet or lagoon, as shown by such species as *Mya*, *Ostrea* and *Venus* and especially by numerous mud crabs and the presence of our edible crab, *Callinectes sapidus*, while the upper beds were deposited during a subsidence of the area contemporaneous with the advance of the Wisconsin ice sheet, as shown by the deeper water and more northern species.

After the destruction and washing into the lagoon of the protecting barrier beach, as shown by the overlying rounded and pure, white sands, the ice reached and passed this point, eventually burying the beds under fifty feet or more of drift. Later, a reelevation took place, bringing the land to about its present position.

Early Stages of some Paleozoic Corals: C. E. GORDON.

J. E. Duerdon in the Johns Hopkins University Circular for 1902 has endeavored to show by studies based on *Lophophyllum proliferum* that the Rugosa exhibit a hexameral plan of growth of the primary septa, in so far as *L. proliferum* may be taken as representative. Certain studies on *Streptelasma profundum* show a primary tetrameral plan. The fact that *S. profundum* is a middle Ordovicic type suggests that this is the primitive condition. Moreover, a careful examination of

Duerdon's figures shows that they lend themselves to an entirely different interpretation from that which Duerdon gives. This interpretation is that two of the so-called primary septa are secondary septa precociously developed; that their sequence and ultimate position are the same as those for the secondary septa which appear in the corresponding positions in the corresponding quadrants of a zaphrentoid coral; that the fossula and cardinal septum are on the concave side of the corallum; and that if Duerdon's figures be inverted they reveal a perfect similarity to a zaphrentoid coral, as far as the order of appearance and the arrangement of the septa are concerned.

The fact that *L. proliferum* is of Carbonic age indicates that it is a modified type of the zaphrentoid coral, the first secondary septa appearing in nepionic stages and thus simulating the character of primary septa.

A New Lower Tertiary Fauna from Chappaquiddick Island, Martha's Vineyard:
THOMAS C. BROWN.

A few years ago while studying the Cretacic deposits of Long Island, Block Island and Martha's Vineyard, Dr. Arthur Hollick made a collection of fossil molluscs and plants from Chappaquiddick Island. The fossil molluscs were deposited in the Columbia University collection without being fully and carefully studied.

These fossils occur in the island in ferruginous concretions. They seem to have been deposited somewhere to the north of where they are now found, then moved as glacial drift, reassorted and deposited in their present position. From their lithological similarity to concretions containing undoubted Cretacic fossils found elsewhere on Martha's Vineyard, Dr. Hollick thought that these concretions and their contained fossils must be of Cretacic age.

Professor Shaler noted the occurrence of these concretions and their similarities to the Cretacic drift, but being unable to find any distinctive organic remains hesitated to set them down as Cretacic.

Professor R. P. Whitfield considered that

these rocks could hardly be Cretacic, since the fossils were of a more recent type.

A careful study of the fossils has shown that this material is not Cretacic but Eocene in age. This fauna from Chappaquiddick represents a new and distinct Eocene province, differing from all the other Eocene provinces of the Atlantic coast, but no more widely different from these than they are from one another. Although in this fauna there are several species somewhat resembling those of the provinces to the south, on the whole it would seem to be more closely allied to the Eocene of England. The genera most abundantly represented in these Chappaquiddick deposits, *e. g.*, *Modiola*, *Glycymeris*, are also among the most abundant in the English deposits. These same genera, although represented in the Atlantic and gulf provinces, are there more sparsely distributed and occur with other more abundantly represented genera that appear to be altogether wanting in the Chappaquiddick deposits.

A comparison of this Chappaquiddick fauna with other Eocene faunas indicates that it is of lower Eocene age, the species most closely resembling those found in this fauna being found in the lower beds of the Atlantic and gulf provinces, the Tejon of California and the lower beds of England. These deposits may possibly be of the same age as the Shark River beds of New Jersey, but being deposited in a region separated from this have no forms in common with it. But such correlation could be only conjecture. As the correlation of the well-known Eocene deposits is even yet very uncertain it is unnecessary and impossible to place these beds any more definitely than simply to say that they are Lower Eocene.

Structural Relations and Origin of the Limonite Beds at Cornwall, N. Y.: C. A. HARTNAGEL.

The limonite at the Townsend iron mine, near Cornwall in Orange County, N. Y., is found at the base of the New Scotland beds where the latter are in contact with the Longwood red shales. The source of the iron is evidently from the red shales but whether the contact was due to overlap or faulting has not been previously explained. Two thirds of a

mile north of the mine the Decker Ferry, Cobleskill, Rondout, Manlius and Coeymans formations, having a total thickness of 95 feet, are found between the New Scotland and Longwood beds. In the region of the mine the strata are nearly vertical and in faulting a wedge-shaped block was forced up, bringing the red shales in contact with the New Scotland beds. A cap of limestone has until recent geologic times protected from erosion the mass of soft Longwood shales which now form a steep hill, but which is rapidly being worn away.

Types of Sedimentary Overlap: A. W. GRABAU.

With a normal sea shore, a rising sea level will produce the phenomenon of progressive overlap, a falling sea level that of regressive overlap. If the sea transgresses slowly, and the rate of supply of detritus is uniform a basal ruddy or arenite is formed which rises in the column as the sea advances, and whose depositional off-shore equivalents are successive beds of lutytes or organic deposits (biogenics). Types of such basal beds which pass diagonally across the time scale, are seen in the basal Cambrian arenites of eastern North America, which as the Vermont Quartzite are lower Cambrian, and as the Potsdam are Upper Cambrian. Again in the Basal Cretacic arenite of southwestern United States, this is shown, these being basal Trinity in Texas, Washita in Kansas, and Dakota or later on the Front Range. Examples of this type of progressive overlap are numerous and familiar. On an ancient peneplain surface the transgressing sea may spread a basal black shale, as in the case of the Eureka (Noel) Black shale, which is basal Choteau in southern Missouri and basal Burlington in northern Arkansas. Regressive movements of the shore succeeded by transgressive movements give us arenites which are enclosed in off-shore sediments and which within themselves comprise an hiatus the magnitude of which diminishes progressively away from the shore. An example of this has recently been discussed by Berkey* who finds that the St. Peter Sandstone in Minnesota marks the interval from

* See *ante*, April meeting.

lower Beekmantown to upper Stones River, which interval is represented by several thousand feet of calcareous sediments in other regions distant from the shore of that time.

In marine transgressive overlaps, later members overlap earlier ones toward the source of supply, *i. e.*, towards the old-land. In non-marine progressive overlaps, later members overlap the earlier ones away from the source of supply. Thus in a growing alluvial cone, the later formed beds will extend farther out on to the plain away from the mountain. If several successive fans of this type are formed one above the other, owing to successive elevations of the source of supply, only the latest beds of each delta will be found on the outer edge of this compound delta, the hiatus between the beds being further emphasized by the erosion which the last bed of the first delta underwent during the time that the early beds of the second delta were deposited nearer the source of supply, *i. e.*, before the last bed of the second delta covered up the remnant of the last bed of the first delta and thus protected it from further erosion. A good example of this type of overlap appears to be presented by the Pocono, Mauch Chunk and Pottsville beds of the Appalachian region. These formations are with exception of the negligible Greenbrier member, of non-marine origin, representing the wash from the growing Appalachians. In western Pennsylvania only the latest beds of each (barring portions removed by erosion between the deposition of the successive fans) are found resting one upon the other, the interval between the beds becoming less and less toward the anthracite regions.

A. W. GRABAU,
Secretary.

SECTION OF BIOLOGY.

At the April meeting Professor H. F. Osborn presented a discussion of 'The Ideas and Terms of Modern Philosophical Anatomy,' and Dr. O. R. Hay described 'Turtles of the Bridger Basin.' The full abstract of Professor Osborn's paper was published in SCIENCE for June 23. Dr. Hay gave a brief description of the extent of the Bridger beds and of the nature of the materials composing them.

He expressed the conviction that these deposits had not been made in a lake, but over the flood-grounds of rivers. The region was probably covered with forests, and teemed with animal life. In the streams were numerous turtles. Many species of these have been described by Dr. Leidy and Professor Cope. In the speaker's hands are materials for the description of about a dozen more species. The American Museum party of 1903 collected many specimens of the genus and these have furnished good skulls, neck, shoulder and pelvic girdles, and the limbs. These materials confirm the validity of Lydekker's group called *Amphichelydia*, and show that from it sprang the modern super-families *Cryptodira* and *Pleurodira*.

At the May meeting of the section papers were presented by Professor E. B. Wilson on 'Observations on the Chromosomes in Hemiptera,' and by Professor H. E. Crampton on 'Correlation and Selection.'

Professor Wilson's paper presented the results of an examination of the mode of distribution of the chromosomes to the spermatozoa in *Lygaeus turcicus*, *Cenus delius*, *Podisus spinosus* and two species of *Euchistus*. In none of these forms is an accessory chromosome (in the ordinary sense) present, all of the spermatozoa receiving the same number of chromosomes, which is one half the spermatogonial number (the latter number is in *Podisus* sixteen, in the other forms fourteen). In all these forms, however, an asymmetry of distribution occurs such that two classes of spermatozoa are formed in equal numbers, both receiving a ring of six chromosomes (in *Podisus* seven) that are duplicated in all the spermatozoa, and in addition a central one which in one half the spermatozoa is much smaller than in the other half. These corresponding but unequal chromosomes (which evidently correspond to some of the forms described by Montgomery as 'chromatin nucleoli,' and agree in mode of distribution with that which this author has described in the case of *Euchistus tristigmus*) may be called the 'idiochromosomes.' They always remain separate in the first division, which accord-

ingly shows one more than one half the spermatogonial number of chromosomes, but at the close of this division conjugate to form an asymmetrical dyad, the number of separate chromatin-elements being thus reduced from eight to seven (in *Podisus* from nine to eight). A reduction of the number to seven in the first division, such as has been described by Montgomery as an occasional or usual process in *Euchistus* and *Cœnus*, was never observed. In the second division the asymmetrical idio-chromosome-dyad separates into its unequal constituents, while the other dyads divide symmetrically. One half the spermatozoa, therefore, receive the large idiochromosome and one half the small, the other chromosomes being exactly duplicated in both.

Correlated with this asymmetry of distribution is the fact that the spermatogonial chromosome-groups do not show two equal micro-chromosomes (as is the case in such forms as *Anasa*, *Alydus* or *Protenor*, where an accessory chromosome is present) but only one, which is obviously the small idiochromosome, the large one not being certainly distinguishable at this period from the other spermatogonial chromosomes. The final synapsis of the idiochromosomes is deferred to the prophases of the second division, somewhat as that of the two equal microchromosomes is deferred until the prophase of the first division in *Anasa*, *Alydus* and some other forms. A remarkable result of the difference in this regard between the forms that possess and those that lack a true accessory chromosome is that in the former case (*Anasa*, *Alydus*, etc.) the first division of the small central chromosome is a reduction-division and the second an equation-division; while in the latter case (*Lygaeus*, *Cœnus*, etc.) the reverse order manifestly occurs. The relation of these observations to earlier ones by Paulmier, Montgomery and others was pointed out, with a discussion of their bearing on the Mendelian phenomena of heredity and the problem of sex-determination.

Professor Crampton presented briefly some of the conclusions drawn from the results of his work upon variation, correlation and selection among saturniid lepidoptera. The earliest

studies showed that eliminated individuals, when compared with similar members of the same group that survive, prove to be more variable and of somewhat different types, although this relation between variability and selection is not a constant one. The characters utilized for these preliminary studies, namely, certain pupal dimensions and proportions were of such a nature that they could not serve the pupa directly in any functional manner, wherefore it was concluded that their condition of correlation formed the actual basis for the selective process, formative correlation being also distinguished from functional correlation. That the general condition of correlation among the structural characters of pupæ formed, indeed, the basis for selection was further indicated by the results of a statistical study of the correlations between various characteristics of pupal groups from several different animal series; although an advantage did not always appear in favor of the surviving group. On the basis of the foregoing, a general theoretical conception was developed, according to which the whole series of internal elements and the whole series of external influences were regarded as involved in the determination of the general condition of correlation or coordination that formed the basis for selection, as adaptive or the reverse.

M. A. BIGELOW,
Secretary.

DISCUSSION AND CORRESPONDENCE.

PRE-PILESTOCENE DEPOSITS AT THIRD CLIFF, MASSACHUSETTS.

TO THE EDITOR OF SCIENCE: It has been suggested by several writers (Shaler and Verrell) that Tertiary and Cretaceous deposits may occur on the floor of the sea north of their known occurrence on Marthas Vineyard and Cape Cod. Their northerly occurrence on land has not been noted except for the Miocene greensands at Marshfield, Mass. (Duxbury sheet, U. S. G. S.). During the spring field season at Harvard University the writer reexamined the coast from Boston Harbor to Peaked Cliff, fifteen miles southeast of Plymouth harbor, in order to test, by